

Effect Of Nursing Intervention Based on Behavioral Shaping Therapy on Blood Glucose Index, Self-Efficacy and Subjective Well-Being in Elderly Patients with T2DM

Wei Zhang

Ping Lin

XiaoYing Zhang

Zhen Zhao

WeiZhang Department of Geriatrics, Beijing Friendship Hospital, Capital Medical University, Beijing 100050, P.R. China, Ping Lin International Medical Center, Beijing Friendship Hospital, Capital Medical University, Beijing 100050, P.R. China, XiaoYing Zhang Department of Geriatrics, Beijing Friendship Hospital, Capital Medical University, Beijing 100050, P.R. China, Zhen Zhao^{*} International Medical Center, Beijing Friendship Hospital, Capital Medical University, Beijing 100050, P.R. China, Corresponding author: Zhen Zhao, Email: haozhen@ccmu.edu.cn

Objective: To investigate the effect of nursing intervention based on behavioral shaping therapy on blood glucose index, self-efficacy and subjective well-being in elderly patients with type 2 diabetes mellitus (T2DM). **Methods:** 100 elderly patients with T2DM admitted to our hospital from February 2019 to January 2020 were selected and divided into control group and observation group according to the random number table method, 50 cases in each group. The control group adopted the nursing method of routine education combined with motivation interview, and the observation group adopted the nursing method of behavior shaping on the basis of the control group. The fasting plasma glucose (FPG), 2h postprandial plasma glucose (2h PG), glycosylated hemoglobin (HbA1c) level, self-management ability score, diabetes management self-efficacy scale (DMSES) score and subjective well-being score were compared between the two groups before and after intervention. **Results:** The levels of FPG, 2h PG and HbA1c in the two groups were significantly decreased, and those of the observation group were significantly lower than those in the control group ($P < 0.05$). After intervention, the total scores of self-management ability, DMSES and subjective well-being of the two groups were significantly increased, and the observation group was significantly higher than the control group ($P < 0.05$). **Conclusion:** Behavioral shaping therapy combined with routine education and motivation interview can significantly improve the self-management ability, self-efficacy, blood glucose index and subjective well-being of elderly patients with T2DM.

Key words: Behavioral shaping therapy; Elderly patients with type 2 diabetes mellitus; Blood glucose index; Self-efficacy; Subjective well-being

Tob Regul Sci.™ 2021;7(5-1): 3204-3211

DOI: doi.org/10.18001/TRS.7.5.1.93

Diabetes mellitus (DM) is a group of metabolic disorders such as fat, water and electrolyte caused by insufficient insulin secretion or reduced insulin sensitivity, which are mostly found in the elderly population¹. And with the aggravation of aging society in China, its incidence rate increases year by year, which seriously threatens the life and health of patients.

Type 2 diabetes mellitus (T2DM) is the main type of DM and accounts for more than 90% of patients². Currently, clinical treatments cannot cure patients with T2DM directly and effectively in a short period of time. After discharge, patients still need to receive long-term care to recover their health. At present, the nursing methods such as routine education, diet intervention, motivation

interview and behavioral shaping therapy are often used in clinical practice to intervene T2DM, which can effectively delay the disease progression of patients. Motivation interview is a guided interview that integrates psychological knowledge such as self-efficacy, cognitive theory and attribution theory. It can dig and increase patients' motivation of behavior change, and then inspire patients' willingness to establish new behavior. However, in routine education and motivation interview, patients are mostly in a passively accepted state, and behavioral changes are not ideal and are not conducive to patient recovery³. Behavioral shaping therapy is a behavioral therapy technique that includes three main interventions: goal-setting, self-monitoring, stimulation, or cue-control, which can help patients effectively establish new behaviors and speed up recovery⁴. To date, there have been few reports of behavioral shaping therapy in elderly patients with T2DM. Based on this, this study investigated the effect of nursing intervention under behavioral shaping theory on blood glucose level and self-management ability in elderly patients with T2DM.

DATA AND METHODS

General data

From February 2019 to January 2020, 100 elderly patients with T2DM admitted to our hospital were randomly divided into control group and observation group, with 50 cases in each group. The differences in general data between the two groups were not statistically significant and were comparable ($P>0.05$). See Table 1. The study was approved by the Ethics Committee of the hospital. Inclusion criteria: met clinical diagnostic criteria for T2DM⁵: fasting plasma glucose (FPG) >126 mg/dl, 2h postprandial plasma glucose (2-h PG) >200 mg/dl, glycosylated hemoglobin (HbA1c) $>7.0\%$; age ≥ 60 years; history of diabetes for >6 months; informed consent and signed informed consent. Exclusion criteria: patients with diseases affecting limb function; patients with psychiatric diseases and cognitive problems; patients with severe visual, hearing or communication difficulties; patients with cardiac, cerebral, pulmonary and renal diseases; patients with history of malignant tumor; patients in acute phase or sub-acute phase of hypertension.

Table 1.
Comparison of general data between the two groups

Group	Number of cases	Gender (M / F) / case	Age / years old	Duration of disease / year	Degree of education / case			Marital status / case		Smoking history / case	History of hypertension / case	BMI/kg/m ²
					Junior school diploma or below	Technical secondary school and high school	Junior college and above	Married	Single			
Observation group	50	30/20	68.53 \pm 5.42	7.12 \pm 2.04	25	15	10	45	5	15	30	24.85 \pm 2.34
Control group	50	32/18	69.14 \pm 6.13	7.20 \pm 2.15	23	19	8	47	3	18	28	24.74 \pm 2.56
$\chi^2/t/Z$		0.170	-0.527	-0.191		-0.113		0.543		0.407	0.164	0.224
P		0.680	0.599	0.849		0.910		0.461		0.523	0.685	0.823

Intervention methods

Control group: nursing care of routine education combined with motivation interview. ① Routine education: Nurses issue health education brochure for T2DM, set up education classroom for T2DM, carry out health education for patients with T2DM, popularize knowledge on causes of T2DM, clinical manifestations, complications, treatment

methods, diet, insulin injection and other aspects, as well as issues need to be noticed in exercise. ② Motivation interview: 2 nurses trained in motivation interview theory performed 4 interviews, about 35 min each time, within 1 month after diagnosis of T2DM. Interview 1 - motivation interview: After the patient was diagnosed with T2DM, the full-time nurse established a harmonious and trustworthy

relationship with the patient, understood the psychological and behavioral changes of the patient, empathized with the patient, conducted adequate communication and guided the patient's bad mood, inspired his motivation to change his/her lifestyle, and guided and facilitated his/her willingness and motivation to establish behavioral changes; after the patient's mood became stable, the doctors and patients jointly discussed to formulate specific intervention plan and self-management plan; one week later, interview 2 was conducted to understand the knowledge of diabetes mellitus in the form of questioning, as well as the behavior compliance and self-management degree in the process of treatment, measure the operability of treatment and management plan, evaluate the intervention effect and make corresponding adjustment according to the patient's own conditions. Interview 3: One week after the interview 2, focus on the degree of change of diet and exercise behavior, the implementation of diet and exercise plan in the past half month, and revise the intervention scheme according to the patient's own situation. Interview 4: one week after the interview 3, evaluate the implementation of the patient and give some guidance. It is suggested that the patient should be actively encouraged to share the blood glucose control with other patients so that the patient can be happy in the process of sharing.

Observation group: On the basis of the control group, the behavior-shaping nursing method was adopted. After diagnosis, the patient was given routine education by the nurse, and the content of routine education was the same as that in the control group; behavioral shaping: Firstly, the patient was evaluated in the first motivation interview, the specific problems of the patient were evaluated to achieve the goal of behavior change, feasible and individualized intervention measures were formulated, and the patient was assisted in the joint implementation. Set behavioral goals for patients in terms of diet, exercise, etc.: develop eating habits with less food, more meals at regular intervals, balanced and healthy nutrition, establish exercise

habits at regular intervals, adhere to exercise, and exercise independently, etc. Divide the difficult goals into 4 small stages, then formulate the behavior requirement of each small stage. After the patient has completed a small stage for one week, immediately conduct the next motivation interview, affirm the change and progress of patient's behavior, continue to stimulate the motivation of patient's behavior change, then enter the next stage, in turn increase the difficulty step by step, and finally complete 4 small stage goals and 4 motivation interviews, make the patient form target behavior; the nurse requires the patient to record his/her diet, exercise and blood glucose condition every day and make summary every week, instructs the patient to see the blood glucose and BMI chart, etc., and firms the confidence in the change of patient's behavior; the nurse helps the patient to master the skill of tolerance to hunger and reasonably control the food intake by prompting the patient to control the feeding speed and meal sequence.

All patients were followed up by home follow-up (home follow-up every half a month for half a year after discharge).

Observation criteria

Blood glucose index levels

Before and After the intervention, 5 mL of fasting venous blood and 5 mL of peripheral venous blood 2h after the meal were collected and placed into EDTA anticoagulant tubes. Plasma FPG and 2h PG levels were measured by glucose oxidase method and fasting HbA1c levels were determined by high performance liquid chromatography (HPLC).

Self-management ability

The self-management behavior scale of T2DM⁶ was used to evaluate the self-management ability of patients in the two groups before and after intervention. The α coefficient of Cronbach was 0.83, including six dimensions of diet control, regular exercise, medication following doctor's advice, blood glucose monitoring, foot care, treatment of high and low blood sugar, with a total of 26 items. The scores of 5, 4, 3, 2 and 1 are

respectively calculated according to the completely done, frequently done, sometimes done, rarely done and completely failed to do, and the higher the score represents the stronger the patient's self-management ability.

Self-efficacy

The self-efficacy of the two groups was assessed by the Diabetes Management Self-Efficacy Scale (DMSES) before and after intervention.⁷ The self-efficacy of the two groups included diet, exercise and reexamination, with a total of 20 items. Higher DMSES scores indicated higher self-efficacy of the patients.

Subjective well-being score

The subjective well-being was evaluated by Memorial University of Newfoundland Happiness Scale (MUNSH)⁵ before and after intervention. The scale consisted of 12 positive factors and 12 negative factors, 24 items in total. The total score and total gained score were calculated. The higher

the total score was, the stronger the subjective well-being is. The total score = total positive factor gained score - negative factor + 24.

Statistical methods

SPSS 20.0 was used for statistical analysis. The measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm s$). The count data were compared with χ^2 test. The comparison was made with t test. The rank sum test was used for comparison. $P < 0.05$ was considered to be statistically significant.

RESULTS

Comparison of blood glucose index levels between the two groups

After intervention, the levels of FPG, 2h PG and HbA1c in the two groups were significantly lower than those before intervention ($P < 0.05$), and the levels in the observation group were significantly lower than that in the control group ($P < 0.05$). See Table 2.

Group	Number of cases	FPG (mmol/L)		2 h PG (mmol/L)		HbA1c (%)	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	50	8.86 \pm 1.74	6.23 \pm 1.12*	15.64 \pm 3.23	8.36 \pm 2.20*	9.12 \pm 1.85	7.13 \pm 1.24*
Control group	50	8.95 \pm 1.83	7.34 \pm 1.37*	15.48 \pm 3.46	10.35 \pm 2.74*	9.20 \pm 1.76	8.27 \pm 1.46*
<i>t</i>		-0.252	-4.436	0.239	-4.004	-0.222	-4.208
<i>P</i>		0.802	0.000	0.812	0.000	0.825	0.000

Note: Compared with before intervention: * $P < 0.05$

Comparison of patients' self-management ability between the two groups

After intervention, the self-management ability scores and total scores of blood glucose monitoring, foot care, diet control and regular exercise in the two groups were significantly higher than those before intervention, and that in the observation group was significantly higher than that in the control group ($P < 0.05$). See Table 3.

Comparison of DMSES scores between the two groups

After intervention, the scores of diets, exercise, re-examination and DMSES in the two groups were significantly higher than those before intervention, and the observation group was significantly higher than that in the control group ($P < 0.05$). See Table 4.

Group	Number of cases	Diet control	Regular exercise	Medication following doctor's advice
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Effect Of Nursing Intervention Based on Behavioral Shaping Therapy on Blood Glucose Index, Self-Efficacy and Subjective Well-Being in Elderly Patients with T2DM

		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention		
Observation group	50	17.23±3.14	25.32±2.85*	12.46±3.12	18.23±1.85*	10.23±1.45	13.56±0.92*		
Control group	50	17.56±3.52	21.33±3.14*	12.70±3.23	15.38±2.17*	9.85±1.84	11.74±1.05*		
<i>t</i>		-0.495	6.653	-0.378	7.067	1.147	9.219		
<i>P</i>		0.622	0.000	0.706	0.000	0.254	0.000		
Group	Number of cases	Blood glucose monitoring		Foot care		Management of high and low blood glucose		Total score	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	50	13.52±2.34	18.23±0.74*	15.23±3.84	22.35±1.76*	12.38±2.37	17.63±1.56*	81.05±12.34	115.32±15.64*
Control group	50	13.84±2.67	16.14±1.72*	14.95±3.47	18.37±2.64*	12.56±2.74	15.38±2.13*	81.46±14.26	98.34±16.33*
<i>t</i>		-0.637	7.893	0.383	8.870	-0.351	6.026	-0.154	5.310
<i>P</i>		0.525	0.000	0.703	0.000	0.726	0.000	0.878	0.000
Note: Compared with before intervention: *P<0.05									

Table 4. Comparison of DMSES scores between the two groups (points)									
Group	Number of cases	Diet		Exercise		Re-examination		Total score	
		Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention	Before intervention	After intervention
Observation group	50	25.78±4.23	65.23±6.25*	10.83±2.58	23.25±2.43*	15.32±2.38	30.38±4.23*	51.93±7.53	118.86±12.52*
Control group	50	26.13±4.75	50.35±5.85*	11.02±2.37	18.35±2.74*	15.83±2.82	23.38±2.76*	52.98±6.86	92.08±13.87*
<i>t</i>		-0.389	12.291	-0.383	9.461	-0.977	9.800	-0.730	10.135
<i>P</i>		0.698	0.000	0.702	0.000	0.331	0.000	0.468	0.000
Note: Compared with before intervention: * <i>P</i> <0.05									

Comparison of subjective well-being scores between the two groups

After intervention, the subjective well-being scores of the two groups were significantly higher than those before intervention, and the observation group was significantly higher than that of the control group (*P*<0.05). See Table 5.

Table 5. Comparison of subjective well-being scores between the two groups (points)			
Group	Number of cases	Before intervention	After intervention
Observation group	50	32.52±4.56	40.23±2.73*
Control group	50	33.13±3.12	37.14±3.15*
<i>t</i>		-0.781	5.242
<i>P</i>		0.437	0.000
Note: Compared with pre-intervention: * <i>P</i> <0.05			

DISCUSSION

Some studies have shown ⁸ that elderly patient with T2DM can effectively control their disease progression through self-medication, diet control and rational exercise. However, elderly patients with T2DM have not strong will, low acceptance of new behaviors, and the adverse old behaviors are deeply ingrained and difficult to change. Therefore, it is of particular importance to seek a nursing approach that can effectively change the adverse lifestyle of elderly patients with T2DM and establish new health behaviors. Behavioral shaping therapy is an intensive treatment technique that uses reinforcement to correct a person's behavior so that it is gradually close to a certain adaptive behavior pattern. Wang Xuhui et al. ⁹ found that in the process of weight loss in patients with obesity-type renal disease, the application of behavioral shaping therapy had good effect, which

could help patients to establish new adaptive behavior and promote patients to recover to health.

Behavioral shaping therapy combined with routine education and motivation interview improves blood glucose index in elderly patients with T2DM

Elderly patients with T2DM are chronically hyperglycemic. FPG, 2h PG and HbA1c are commonly used blood glucose indexes. Higher levels of FPG, 2h PG and HbA1c represent higher body glucose¹⁰. Studies¹¹ have shown that HbA1c levels are strongly associated with the risk of mortality correlated with peripheral vascular complications, suggesting that lowering blood glucose is important for the health of patients with T2DM. The results of this study showed that the levels of FPG, 2h PG and HbA1c in the two groups after intervention were significantly lower than those before intervention, and the levels of FPG, 2h PG and HbA1c in the observation group were significantly lower than those in the control group, indicating that behavioral shaping therapy combined with routine education and motivation interview intervention in elderly patients with T2DM can significantly improve the blood glucose index. Routine education can help patients understand the harm of continuous hyperglycemia, and draw attention to the behavior of controlling blood glucose. The addition of motivation interview on the basis of routine health education can help guide patients to realize the importance and necessity of daily blood glucose control, arouse patients' motivation for monitoring and managing their own blood glucose, motivate patients to change the behavior affecting blood glucose fluctuation, and facilitate behavior shaping. In behavioral shaping therapy, nurses help patients to effectively control blood glucose and maintain stable blood glucose level by guiding patients to gradually develop the behavior of regular medication and discard adverse medication habits. At the same time, patients are able to develop good diet and exercise habits that are driven by behavioral shaping therapy to avoid dramatic fluctuations in blood glucose levels due to

inappropriate diet or exercise.

Behavioral shaping therapy combined with routine education and motivation interview can improve the self-competence of elderly patients with T2DM

Self-efficacy is an individual's confidence in changing his or her own behavior, and good self-management skills are key to effective blood glucose control¹². The results of this study showed that the total scores of self-management ability and DMSES in the two groups after intervention were significantly higher than those before intervention, and the total scores of self-management ability and DMSES in the observation group were significantly higher than those in the control group, indicating that the ability of self-management and self-efficacy of the patients with T2DM were significantly improved by the combination of behavioral shaping therapy and routine education and motivation interview. Studies¹³ showed that elderly patients with T2DM tend to forget a lot of information because of their older age and poor memory after routine education, and that half of the information they remember is wrong, which affects the effect of the intervention. Motivation interview is conducted in the process of patient behavioral shaping, which can excavate and solve the inner contradictions in the process of patient behavioral shaping, mobilize their own inner initiative, stimulate or strengthen their motivation of self-behavior change, so as to promote the change of behavior mode step by step. In addition, behavioral shaping therapy, which urges and strengthens the patient's daily behavior of recording his/her diet, exercise, and blood glucose status, and conducting weekly summaries, helps the patient identify and discard his/her own bad habits and behaviors, thus helping the patient to establish lasting and stable good habits. At the same time, behavioral shaping therapy can help patients to establish healthy behavior more realistically, and make up the gap between motivation interview and behavior establishment, which is more favorable for patients to accept. Secondly, procedural operation in behavioral shaping therapy is easy to guide patients to establish new adaptive behavior and life

style, help to arouse or enhance their determination to change their daily bad behavior and the confidence of fighting against disease, further improve patients' self-management ability, improve treatment compliance and speed up recovery by strengthening the role of motivation interview.

Behavioral shaping therapy combined with routine education and motivation interview can enhance subjective well-being in elderly patients with T2DM.

Due to the multi-factor influence of elderly patients such as insufficient self-management ability and poor medication compliance, the patients had poor blood glucose control and were prone to negative emotions such as anxiety and depression, which seriously affected the patients' subjective well-being¹⁴. Subjective well-being represents a person's happy emotional reaction and overall life satisfaction. Subjective well-being can affect people's intelligence, physical ability, social, psychological and other aspects, and it is the reflection of personal happy emotion and overall life satisfaction. By measuring the MUNSH score of the two groups, we found that the subjective well-being score of the observation group was significantly higher than that of the control group, which indicated that the behavioral shaping therapy combined with routine education and motivation interview intervention could significantly improve the subjective well-being of the elderly patients with T2DM. Behavioral shaping therapy can effectively improve the patient's self-efficacy by constantly enhancing his/her ability to act, thereby alleviating and improving his/her anxiety and depression in the face of illness, reducing negative factors and enlarging the influence of positive factors, thus helping to improve the patient's subjective well-being¹⁵. Routine education involves only the popularization of knowledge about diseases and health, but not enough attention is paid to the psychological aspects of the patient's bad mood, subjective well-being, etc.¹⁶. Motivation interview can empathize with the patient in the process of understanding the patient's psychological feeling, so that the patient can feel warm, and

encourage the patient to share the blood glucose control with other patients, so that the patient can be happy in the process of sharing; however, if the patient's behavioral change motivation has not been stimulated, the behavior has not been changed, resulting in the disease worsening, easy to induce bad mood and reduce the subjective well-being. In addition, in the behavioral shaping therapy, under the guidance of nurses, the patients improve their self-management ability and self-efficacy, while improving their ability, the patients effectively control their own condition and reduce the bad mood caused by the poor condition; secondly, the nurses divide the difficult goals into several small stages to guide the patients to accomplish it step by step according to the patient's condition, which increases the patient's pleasure in achieving the small goal and greater confidence in the patient's ability to achieve the objectives of the next stage.

In conclusion, behavioral shaping therapy combined with routine education and motivation interview intervention in elderly patients with T2DM can significantly improve blood glucose index, self-management ability and self-efficacy, and enhance patients' subjective well-being.

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Effect Of Nursing Intervention Based on Behavioral Shaping Therapy on Blood Glucose Index, Self-Efficacy and Subjective Well-Being in Elderly Patients with T2DM

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